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Oregon Agricultural College
Experiment Station

Farm Crops Department

Seed Potato Improvement

By
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CORVALLIS, OREGON

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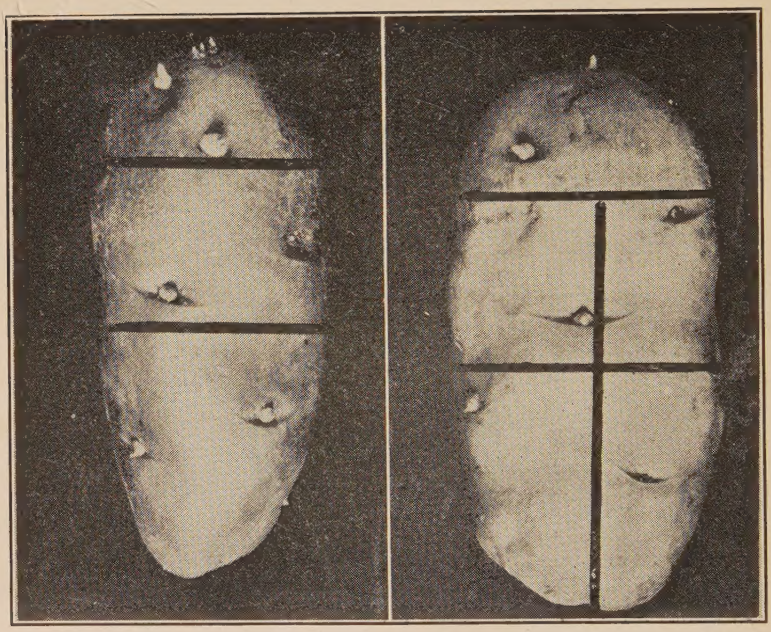

Fig. 1. An eight-ounce American Wonder potato cut right, to save the blossom-end piece. Left, edge view; right, flat view of potato after cutting.

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NEED FOR IMPROVEMENT

The average acre production of potatoes for Oregon in 1921 was 90 bushels. Twenty other states exceeded it. Maine, with three times our acreage produced an average acre yield of 288 bushels. This is 3.2 times our acre production for the same year.

Maine's ten-year average acre production for the years 1912 to 1921 inclusive was 210 bushels compared with 118 for Oregon. Oregon was twelfth in the United States in production to the acre for the decade. That Oregon's production is perhaps slowly improving is indicated by the following United States Department of Agriculture statistics by decades for Oregon for 50 years.

Years	1870-79	1880-89	1890-99	1900-10	1910-19
Acre yield	115	98	103	109	120

WHY SUCH SMALL YIELDS

The small yields are due to four principal causes.

I. TOO MANY VARIETIES

Varietal Standardization Needed. Potatoes of Oregon must be standardized on varieties that will yield well, sell well, and be of good cooking quality. Earliest of All and Early Ohio are good early varieties for Eastern Oregon. Earliest of All and Early Rose are excellent for Western Oregon.

For Eastern Oregon main-crop potatoes, Netted Gems, Burbanks, and Idaho Rurals are very good. Western Oregon varieties are Burbank, American Wonder, Gold Coin, Pacific White Rose, and some Garnet Chili for a special market.

Many other varieties and strains would better be dropped because of low yields, poor market, and poor quality.

II. UNPRODUCTIVE HILLS

Many fields have low yields because of planting run-out and diseased seed. Such seed produces hills that die early and yield few if any marketable potatoes. These unproductive hills may be eliminated in part by selecting only smooth, symmetrical, disease-free tubers of market size, treating properly with the corrosive sublimate and using plenty of seed cut right.

Planting rough, pointed, crooked, or misshapen tubers or little ones usually means diseased plants. These off-type potatoes are often the result of infection with some form of wilt and the little ones often are small because of wilt or mosaic. These are the most difficult of the tuber-borne diseases to combat. A lot of potatoes rough or small is usually diseased.* Failure to treat permits more disease to develop and low yields are harvested.

*Full description of these diseases may be found in Oregon Agricultural College Experiment Station Circular 24.

III. POOR STANDS

Examinations during the growing season show that many fields are full of missing places. Large yields cannot be secured from empty fields. Plants must be there in large numbers to get good yields.

Planting Machines. The best average stands are secured with the "two man" potato planters. Next often comes hand planting, and usually the poorest average stands come from the "one man" type of planter. Faulty planting makes thin stands.

Small Pieces Bad. Some thin stands are in part due to the use of too-small seed pieces. Pieces one and one-half to two ounces or larger in size should be used. The blossom-end piece of the potato should never be split in cutting.

Coating the cut surfaces of the seed with land-plaster helps to prevent rotting of seed pieces in the ground and better stands result. Many diseased or untreated seed pieces never produce a plant, or it dies early and leaves a vacant, unproductive place in the field. Properly treated, disease-free seed cut large and land-plastered makes the best and most vigorous stands.

IV. NOT ENOUGH PLANT FOOD OR MOISTURE

Many potato soils have become run down through continuous cropping to cereal and cultivated crops and without legumes. Such lands frequently lack nitrogen, and sometimes other plant foods are lacking, which are necessary for good potato production. Where alfalfa or clover precede the potato crop, good yields are usually secured. This is especially true where the legume has been fertilized with a material carrying sulfur.

On non-legume soils where moisture conditions are good; sulfate of ammonia at 100 to 200 pounds an acre has been found beneficial in both Eastern and Western Oregon. Where the growing season is short or the moisture is limited usually the smaller amount should be used.

Occasionally in some Western Oregon hill soils, superphosphate may prove beneficial. It is put on at 150 to 250 pounds an acre.

Commercial fertilizer should usually be broadcasted and worked into the soil, or if drilled should not come in direct contact with the seed piece.

Rotation of crop with legumes is the best plan, and potatoes should not be grown on the same land more often than once in three to six years.

Planting potatoes on land that has produced diseased potatoes usually results in much disease and small yields.

IMPROVEMENT ATTEMPTS

To improve the potatoes of the State, the Extension Service has been for several years conducting a potato-certification project. This has been helpful in improving potato culture, but not enough seed has been certified to meet local needs. Seed imported from another state has not proved of very good quality thus far. Certification, after all, is only secondary, as seed of quality good enough to certify produces better yields and quality of crop. Yields and freedom from disease are the real objectives and certification is the mark of that achievement.

HOW TO IMPROVE SEED

The Oregon Agricultural College Experiment Station proposes the following procedure in cleaning up Oregon seed in order that more Oregon farmers may secure better yield and quality and achieve the distinction of certification.

I. USE FOR SEED ONLY SMOOTH, SYMMETRICAL, MEDIUM-SIZED TUBERS

Sort the Seed. Misshaped, pointed, crooked, and little potatoes are often the result of bad disease infection. The best plan is to use for seed only tubers that are smooth, symmetrical, of medium size and that are well filled out at both ends, especially the stem end.

By selecting to this type many of the badly diseased tubers will be thrown out. While such potatoes may be used for food, they should never be planted.

Single Drops Bad. The planting of single drops—small culls sorted out of market potatoes—is a bad practice and may mean a predominance of disease and low yields.

Careful selection of the seed tubers reduces the percentage of disease but cannot completely eliminate it.

II. CLIP OFF THE STEM END OF THE POTATO AND EXAMINE FOR STEM-END DISCOLORATION

How It Looks. The stem-end discoloration referred to appears as a brown, fibrous discoloration spreading out from the base of the stem of the potato and about one-eighth inch under the skin. This may be the result of several causes, including chilling and disease. Since potatoes with a good clean white color are a better type to produce, those having the stem-end discoloration should be discarded.

Chilled Seed. Badly chilled seed in the Experiment Station trial in 1920 showed very low vitality and poor yields. Potatoes thoroughly chilled in the soil before digging or afterward in storage usually show a discoloration about one-eighth inch under the skin and extending in a thin black layer or line from the stem end to the blossom end of the tuber. The general presence of the black line rather than a lighter-colored one principally near the stem end, when accompanied by lack of crispness and by a sweetish taste in the tuber, are indicative of chilling injury. Such potatoes while not diseased are not good seed.

Wilt. Many tubers affected with wilt show stem-end discoloration although many discolored tubers may not have wilt. Wilt enters the tuber through the stem. It often causes the fibrous, thread-like structures that spread out from the end of the stem and are about one-eighth of an inch under the skin to turn brown in color. This discoloration may extend in only a little way, or in some cases it may extend well toward the blossom end of the potato. In the latter cases if the potato is cut crosswise, the discoloration appears as a thin brown ring about an eighth of an inch under the skin of the potato. In many instances the discoloration may be slight and extend into the tuber but a short distance. The stem itself generally is dead to the place where the fibers spread out.

In examining the tubers, one should have about three to four thin sharp knives. Thin slices should be cut across the potato to cut just

under the end of the dead stem. If any brown discoloration appears spreading out distinctly from the stem, the potato should not be used for seed. The knife should be disinfected by dipping in a solution made up at the rate of one pint of formaldehyde to ten gallons of water. This is to avoid danger of carrying disease to the next tuber.

All tubers showing clean and white just below the base of the stem, and showing no brown fibers should be saved for seed. They are likely to be more free from wilt than unclipped and unselected seed. Washing dirty potatoes before clipping prevents "smudging" the cut end and makes the clipping operation faster, easier, and more accurate.

III. TREAT ALL SEED IN A CORROSIVE SUBLIMATE SOLUTION

Corrosive sublimate, sometimes called mercuric chloride, is a very poisonous chemical in white crystalline or powder form. It may be bought at most drug stores. About one ounce is required for each three to five bushels of potatoes to be treated. The solution must be prepared and handled in stone or wooden containers. A stock solution of corrosive sublimate is prepared by dissolving it in hot water in a crock, wooden bucket, or barrel. A gallon of hot water is used for each four ounces of corrosive sublimate. The druggist will gladly weigh out the corrosive sublimate in one-, two-, or four-ounce packages, as desired. When thoroughly dissolved, one gallon of this solution is put into the wooden treating trough or barrel for each 29 gallons of water used. This makes the *standard strength of solution*—4 ounces to 30 gallons.

The clean, clipped potatoes are now treated loose in this solution for one and one-half to two hours, unless the sprouts have started, in which case, the treatment should not extend over one hour. The solution may then be drawn off from the bottom of the trough or barrel or if the potatoes are being treated in wooden crates, they may be lifted out and drained. Since treating in the solution weakens it, after each treatment one pint of the stock solution should be added to the vat or barrel, for each four bushels of potatoes treated two hours. If treated less than two hours, a proportionately smaller amount should be used. The solution in the vat or barrel is kept up to its original level by adding solution of standard strength—4 ounces to 30 gallons of water, as needed. The use of the solution may be continued while it remains clear and this may be for seven or eight treatments.

Dirty potatoes should be washed before treating. If this is done 12 to 24 hours before, it will soften up many of the large, black, scurfy spots of Rhizoctonia, making the treatment more effective.

This treatment kills most of the scab and Rhizoctonia. No potatoes should be planted without treating the seed.

IV. CUT THE POTATOES TO SAVE THE BLOSSOM-END PIECE

How to Cut. Several years' work at the Experiment Station shows that the blossom-end piece of the potato is the best seed piece. The common practice of splitting the blossom end in cutting seed potatoes greatly impairs the vigor of the plants and reduces the yield. Potatoes should be cut to save the blossom-end piece as shown in Fig. 1. A forthcoming bulletin on potatoes will show this in detail.

Reasons for Blossom-end Cut. There are four reasons:

1. The terminal sprout is usually the most vigorous.
2. The blossom-end pieces produce more sprouts and therefore more plants to the hill.
3. The blossom end is farthest from the stem end where the wilt enters and it has less disease to limit the crop.
4. The yield is greater.

The blossom-end pieces will be most free from disease and should be kept separate, although after the selection, clipping, and treatment, the other pieces of the potato will also be good seed if cut large enough to have plenty of eyes.

Size of Piece. All potato-seed pieces should be cut to have not fewer than two eyes; more are better. The pieces should weigh not under one and one-half to two ounces. On rich soils with plenty of moisture, larger pieces may be advantageously used. In frosty sections, plants from large seed pieces recover from frost injury more quickly.

V. COAT CUT SEED WITH LAND-PLASTER

Freshly cut seed while still wet should be shoveled over with land-plaster, as this coats or hardens the cut surface. It prevents much rotting of the seed in the soil and appears to stimulate growth. Station results show that in cold soils where sprouting is slow, better stands and yields are secured where land-plaster has been used. A one-hundred-pound bag of land-plaster will coat about 35 to 40 bushels of potatoes cut for seed. The cut and coated seed should be planted soon or spread out in a thin layer to prevent spoiling.

VI. PLANT THE POTATOES ON CLEAN LAND

The selected, treated, plastered blossom-end cuts should be planted only on new land or on land that has had no potatoes, volunteer or otherwise, for many years. The same kind of clean land may be used for the other pieces, but the two lots of cut seed should be kept separate.

Disease Remains in Soil. Some diseases remain in the land for several years. Even when the clean seed is planted in a field soon after a diseased crop has been grown, it will become full of the disease. Potatoes free enough from disease to certify should not be grown on the land more often than once in three or four years. Where common potatoes have been grown, a longer rotation is necessary because of the disease in the soil.

Permanent potato production calls for a regular rotation. The land for potatoes should be planned ahead and a legume crop should precede the potato crop.

VII. PLANT TO GET A STAND

Seed Bed. Potatoes should be planted in a good, deep, mellow seed bed. Hard or cloddy soil is not good for potatoes.

Planting. Use a machine that will plant the pieces regularly and where you want them. See that it plants one piece in every hill and only one piece in any hill. Otherwise plant by hand.

Time of Planting. Planting should be done after frost danger is over. In Western Oregon April or June is usually best. May is not considered good unless irrigation is possible.

In Eastern Oregon at low elevations, March or April planting is good for early varieties. May and June planting is preferred in higher or irrigated districts.

VIII. KEEP FIELDS CLEAN OF WEEDS

Cultivation. Potatoes are usually harrowed before and after coming up and until they are three or four inches high. Shallow thorough cultivation is then needed often enough to control weeds. Level culture is best except where the soil is cold and moist or where it is irrigated. Slight ridging may sometimes be necessary to keep tubers from bulging out and sunburning. Cultivate only when vines are dry. Weeds are most easily killed while they are small. Cultivation when the ground is dry and free from weeds is unnecessary.

IX. ROGUE OUT ALL WEAK, SICK, OR DISEASED PLANTS

Unproductive Plants. Weak or diseased potato plants are unproductive and in most cases cannot be cured. Frequent field inspections should be made by the grower and when any plant looks weak, or unhealthy, it should be dug out, seed piece and all, and removed from the field at once before the trouble spreads to other plants.

These weak and diseased plants are not good producers and their removal makes no material reduction in yield and does prevent spread of disease. This roguing out of diseased plants should be carefully done and will most likely result in clean, high-yielding seed.

Mark Vigorous Hills. While going through the fields often outstandingly vigorous plants may be seen—large growers, that are healthy and not next to any diseased plants. Such healthy plants should be marked with a stake for separate digging. If these are good producers, they should be saved for next year's seed plot.

X. HARVEST AND STORE CAREFULLY

Hill Select. If no hills have been marked during the growing season it is a good plan to select a few—50 or more hills—that appear vigorous, healthy, and are large producers, 5 pounds or more to the hill, and save them for seed-plot planting the next year. Take no hills from next to a diseased plant or a place from which a diseased plant has been removed.

Hill selection helps to pick out the cream of the seed for use in the seed plot the next year. The first year's selections usually make the most pronounced results.

Dig all potatoes to avoid cutting or injuring the tubers. This is best done after fall rains when the land is cool and soft as the potatoes are in better condition for storage.

Sort out all damaged, misshaped, and small potatoes and keep only the sound, symmetrical tubers for seed.

The seed stock should be cool and dry when put into storage and should be kept that way. Adequate protection against chilling or freezing is vital, but more seed stock in Oregon is injured by being stored in moist, poorly ventilated bins or pits than by chilling.

Sound, smooth, dry, sizable potatoes in storage are of exceptional quality when from selected, clipped, treated, plastered seed, cut right, and grown in rich, disease-free fields carefully rogued. Such seed will bring good prices and is capable of producing good yields. Such seed will in most cases bring the owner the distinction of *certified quality.*